

We Claim:

1. A chemical detection system for detecting the presence of at least one chemical comprising at least one organism trained to display a recordable response behavior to at least one chemical, at least one detection chamber housing said organism, and an air system for drawing an air sample for chemical detection into the chamber over the trained insect.
2. The system of claim 1 wherein said organism is an invertebrate.
3. The system of claim 2 wherein said invertebrate is an insect.
4. The system of claim 1 wherein said system further comprises a sensor located in said chamber and a data analysis system for reporting said response wherein said analysis system is operatively connected to said sensor.
5. The system of claim 4 wherein said sensor is an electronic sensor.

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6. The system of claim 1 wherein said system contains multiple detection chambers for determining per cent response to a single chemical or for determining the presence of multiple chemicals.

7. A method for detecting the presence of at least one chemical comprising

(a) placing at least one organism trained to detect a chemical into a chamber comprising a compartment for said organism, a sample compartment, a divider with an opening wherein said divider is located between said organism compartment and said sample compartment,

(b) introducing a sample of air into said sample compartment and drawing it through said opening in the divider into the organism compartment, and

(c) recording a response behavior of said at least one organism to determine the presence of said chemical.

8. The method of claim 7 wherein said trained organism is an invertebrate.

9. The method of claim 8 wherein said invertebrate is an insect.

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10. The method of claim 7 wherein said divider contains a sensor and a data analysis system for reporting said response wherein said analysis system is operatively connected to said sensor.

11. An organism trained to detect the presence of at least one chemical in a sample of air wherein said organism can display a response behavior to said at least one chemical.

12. The organism of claim 11 wherein said organism is an invertebrate organism.

13. The organism of claim 12 wherein said invertebrate organism is an insect.

14. An organism trained to detect at least one chemical outside of the organism's biological context comprising

an organism that displays a recordable response behavior to at least one chemical outside of the organisms biological behavioral context, wherein said behavior is one that an untrained organism would only display in its own biological behavioral context.

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15. The organism of claim 14 wherein said organism is an invertebrate.

16. The organism of claim 15 wherein said invertebrate is an insect.

17. A method for training organisms to detect at least one chemical comprising:

(a) presenting an organism in the immediate presence of a biological resource,

(b) drawing air from around a target chemical over said organism while it contacts said biological resource,

(c) removing said organism from said biological resource after it displays a response behavior to said resource,

(d) repeating steps (a)-(c) at least about two times in the immediate presence of the biological resource to obtain a trained organism which displays a response behavior to a target chemical without the presence of a biological resource.

18. The method of claim 17 wherein said biological resource is selected from the group consisting of food, host, mate, and prey.

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19. A trained organism trained according to the method of claim 17.

20. A trained organism trained according to the method of claim 18.

21. A chemical detection system for detecting the presence of at least one chemical comprising:

(a) a means for introducing a sample of air from an area suspected of containing a chemical into at least one detector chamber,

(b) at least one detector chamber operatively connected to said means for introducing a sample of air,

(c) a power source operatively connected to said means for introducing a sample of air,

(d) a sensor means for detecting a response by an organism trained to detect said chemical in a sample of air wherein said organism is in said detector chamber, and

(e) a data analysis system operatively connected to said sensor.

22. The system of claim 21 wherein said means for introducing a

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sample of air into at least one detector chamber includes an air pump, a flow control valve, and a meter.

23. The system of claim 21 wherein said sensor means for detecting a response is selected from the group consisting of an infrared sensor, a visible light sensor, and a laser sensor.

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